

# CBO

## Preserving the Navy's Forward Presence With a Smaller Fleet



MARCH 2015

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>MAR 2015</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2015 to 00-00-2015</b>	
4. TITLE AND SUBTITLE <b>Preserving the Navy's Forward Presence With a Smaller Fleet</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Congressional Budget Office,Ford House Office Building, Fourth Floor,Second and D Streets, SW,Washington,DC,20515-6925</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>33</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

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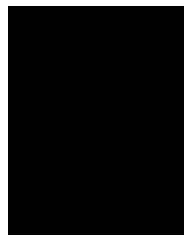
## Notes

Unless otherwise indicated, all dollar amounts in this report reflect budget authority in 2014 dollars, and all years are federal fiscal years (which run from October 1 to September 30 and are designated by the calendar year in which they end).

Numbers in the text and tables may not add up to totals because of rounding.

On the cover: U.S.S. *McCampbell* (DDG 85), Yokosuka, Japan, July 2014. U.S. Navy photo by Mass Communication Specialist Seaman Amanda S. Kitchner.

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# Preserving the Navy's Forward Presence With a Smaller Fleet

## Summary

In support of its mission to deter conflict or fight in wars if necessary, the Navy considers it a core responsibility to maintain a forward presence—to keep some of its fleet far from U.S. shores at all times in areas that are important to national interests. Toward that end, at any given time, about one-third of the fleet is deployed overseas. The rest of the Navy's ships are in or near their home ports in the United States for maintenance, training, or sustainment (a period in which a ship is in port but ready to deploy quickly). Most of the ships that contribute to the Navy's current forward presence of about 100 ships sail from ports in the United States; 31 others are now stationed permanently in foreign countries or at overseas U.S. military bases. In the future, the Navy expects to boost the proportion of ships that it bases abroad.

The Congressional Budget Office estimates that, for the next 30 years, the Navy's 2015 shipbuilding plan (which aims to increase the fleet from 281 ships in 2014 to 306 ships by 2022) would cost about \$21 billion annually, on average, in constant 2014 dollars.<sup>1</sup> The Navy's estimates set the figure somewhat lower—at about \$19 billion per year.<sup>2</sup> Both estimates are greater than the annual average of almost \$16 billion that the Navy has spent for the past three decades, which suggests that the

Navy may have difficulty affording its plans. The Chief of Naval Operations' emphasis on forward operations indicates that the Navy has committed to maintaining the largest possible forward presence under any given budget plan.<sup>3</sup>

## What Size Fleet Could the Navy Maintain With Smaller Shipbuilding Budgets?

CBO assessed the effects of three smaller annual shipbuilding budgets—\$16 billion, \$14 billion, and \$12 billion—for the next 30 years. In all three cases, by 2044, the fleet would be smaller than would be the case under the Navy's current plan:

- Under the \$16 billion budget, by 2044, the fleet would consist of 251 ships, 17 percent fewer than under the Navy's current plan;
- Under the \$14 billion budget, it would be 230 ships, 24 percent fewer than under the current plan; and
- Under the \$12 billion budget, it would be 208 ships, 31 percent fewer than under the current plan (see Table 1).

Those estimates reflect an assumption that the Navy would reduce the number of its major warships—aircraft carriers, surface combatants, submarines, and amphibious warfare ships—in rough proportion to their current share of the fleet.

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1. See Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2015 Shipbuilding Plan* (December 2014), [www.cbo.gov/publication/49818](http://www.cbo.gov/publication/49818). All dollar amounts presented in this report are in 2014 dollars.

2. See Department of the Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2015* (July 2014), <http://go.usa.gov/FYZR> (PDF, 3.4 MB).

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3. See Department of the Navy, Chief of Naval Operations, *CNO's Sailing Directions* (accessed March 12, 2015), <http://go.usa.gov/feez> (PDF, 163 KB).

**Table 1.****Fleet Characteristics and Costs of Maintaining the Navy's Forward Presence Under Various Shipbuilding Budgets, 2044**

	Average Annual Shipbuilding Budget		
	\$16 Billion	\$14 Billion	\$12 Billion
Fleet Inventory, 2044	251	230	208
Reduction in Ships From Navy Plan (Percent)	17	24	31
Annual Cost Savings, Operation and Support (Billions of 2014 dollars) <sup>a</sup>	6	10	13
<b>Approach 1: Increase the Length of Deployments for U.S.-Based Ships</b>			
Ships Providing Forward Presence At Any Given Time	113	111	108
<i>Deployment Length/Operating Cycle (Months)</i>			
Type of Ship			
Aircraft carrier	10/36	6 and 6/36 <sup>b</sup>	7 and 7/36 <sup>b</sup>
Large surface combatant	10/36	6 and 6/36 <sup>b</sup>	7 and 7/36 <sup>b</sup>
Attack submarine	7/24 <sup>c</sup>	7/24 <sup>c</sup>	7/24 <sup>c</sup>
Amphibious warfare ship	8/27	9/27	9/27
Cost (Billions of 2014 dollars)			
Annual recurring	Less than 0.5	Less than 1	Less than 5
Onetime	0	0	0
<i>Key Challenges to Implementation</i>			
- Retention of Sailors Because of Long Deployments			
- Endurance of Crews in Future Crises			
- Ship Maintenance			
<b>Approach 2: Base More Ships Overseas and Use More Rotating Crews</b>			
Ships Providing Forward Presence At Any Given Time	113	112	110
<i>Additional Ships Based Overseas, Additional Ships With Rotating Crews</i>			
Type of Ship			
Aircraft carrier	1, 0	1, 0	2, 0
Large surface combatant	4, 0	4, 6	5, 10
Attack submarine	7, 6	7, 8	9, 10
Amphibious warfare ship	2, 0	2, 2	2, 2
Cost (Billions of 2014 dollars)			
Annual recurring	Less than 1	Less than 5	Less than 10
Onetime	3 to 10	3 to 10	16 to 25
<i>Key Challenges to Implementation</i>			
- Building Overseas Capacity			
- Adapting to New Rotation Procedures			
- Keeping the Fleet Secure			

Source: Congressional Budget Office.

Note: All costs are in billions of 2014 dollars.

- a. Figures are for operation and support savings before adjustment using either Approach 1 or Approach 2.
- b. The U.S.-based aircraft carriers and large surface combatants would conduct two 6- or 7-month deployments over the 36-month operating cycle.
- c. Some attack submarines would conduct 7-month deployments and some would conduct 6-month deployments.

### How Could the Navy Maintain Its Forward Presence Under Smaller Shipbuilding Budgets?

The Navy could maximize its forward presence with smaller budgets by expanding the use of three methods that it currently applies to boost overseas operations:

- Deploying ships for longer periods,
- Basing more ships and their crews overseas, and
- Assigning more than one crew to some ships to permit longer deployments.

Even under smaller budgets, CBO found, the Navy could expand its use of each method to maintain the current forward presence, although all three involve costs and pose disadvantages. And even though the Navy might be able to maintain its forward presence by making more use of those methods, smaller fleets would nonetheless reduce the service's ability to implement its war plans in the event of conflict and would limit its flexibility in a crisis short of war.

The Navy also could use different mixes of those methods to maintain its forward presence. To illustrate a range of possibilities, CBO analyzed two basic approaches: The first would simply lengthen many ships' deployments; the second would combine the other two methods into a single approach to increase the efficiency of the ships' use.

**Approach 1: Deploy Ships for Longer Periods.** Under this approach, the Navy's ships would undertake more frequent and longer deployments. For example, with an annual shipbuilding budget of \$16 billion, most large surface combatants (cruisers and destroyers) and aircraft carriers would be deployed for 10 months out of a 36-month operating cycle (or 28 percent of the time—the other 26 months would be devoted to maintenance, training, and sustainment); under a \$14 billion budget, those ships would be deployed twice in a 36-month cycle, for 6 months each time (or 33 percent of the time); and under a \$12 billion annual budget, the ships would be deployed twice in a 36-month cycle, but for 7 months each time (or 39 percent of the time). By comparison, in 2013, the Navy's destroyers were deployed, on average, for a little longer than 7 months out of a 27-month operating cycle, or about 26 percent of the time.

Longer deployments are more expensive than shorter deployments but, under the scenarios considered in this

report, longer deployments are less expensive than buying larger fleets. Costs increase for longer deployments because sailors are paid more while they are at sea, ships consume more fuel, and equipment must be replaced sooner because it wears out faster. But the additional operating costs of longer deployments would be considerably less than the savings that would result from the lower procurement costs and smaller operating budgets required to maintain smaller fleets. As a result, by CBO's estimate, this approach would save between \$11 billion and \$17 billion per year, depending on the size of the fleet.

Several disadvantages, sometimes with accumulating effects, can arise from longer periods at sea. For example, if the ships must be deployed quickly because of a crisis or a war, crew members who have already been at sea for an extended time could be tired. Longer deployments subject sailors and families alike to added stress, which might hamper the Navy's retention of crew members. Higher sea pay or larger retention bonuses might or might not mitigate that problem. If ships are away from home ports more often or for longer periods, maintenance schedules could be disrupted or altered; if that resulted in less effective or less timely maintenance, ships might not be able to remain in the fleet until the end of their expected service lives. Planning for longer deployments and increasing maintenance may mitigate that problem.

**Approach 2: Base More Ships Overseas and Rotate Crews on More Ships.** The second approach CBO examined would require the Navy to base another 14 to 18 ships—including aircraft carriers—overseas and to increase by between 12 and 22 (depending on the shipbuilding budget) the number of ships that used rotating crews. Basing more ships overseas can avert some challenges of longer deployments—crews are not as tired and are able to spend more time at home—and ships are more likely to be close to crisis spots. But this approach would save less than the first, mainly because of higher expenses for maintenance and personnel as a result of operating the ships more and using more crews. The increased spending could offset a substantial portion of the savings from smaller procurement and operating budgets, particularly at the lowest of the three budget amounts, but this approach could still save between \$10 billion and \$12 billion each year, depending on the size of the fleet.



Rotating crews pose several disadvantages, however. Their use on attack submarines, destroyers, and amphibious warfare ships could raise logistical and cultural challenges. In particular, the Navy would need to keep the crews that are not deployed trained and ready to go to sea when their turn arose to operate the ships. Crews might identify less with a particular ship—possibly resulting in lower-quality work or diminished attention to maintaining equipment in the best possible condition. The Navy has overcome such challenges in the past, notably in its staffing of ballistic missile submarines with a pair of crews alternating on fixed-period deployments. The Navy also uses rotating crews on its new littoral combat ships, but widespread application of dual and multiple crewing to other parts of the fleet would present a greater challenge.

Expanding the Navy's forward presence by basing more ships abroad might reassure allies or deter potential adversaries, but it also could increase the fleet's vulnerability to attack. For example, a larger concentration of naval forces based overseas would make the fleet more vulnerable to a surprise attack by another nation, by terrorists, or by other nonstate actors. And overseas bases can be closed off relatively quickly if a host government decides it no longer wants U.S. Navy ships based in its harbors. Finally, some challenges could be economic: With more ships based overseas, some areas in the United States near naval bases would see reduced economic activity (while the host countries might see more).

## The Navy's 2015 Shipbuilding Plan

In its most recent shipbuilding plan, the Navy proposes to purchase 264 ships over the period from 2015 to 2044: 6 aircraft carriers, 12 ballistic missile submarines, 48 attack submarines, 65 destroyers, 66 littoral combat ships, 21 amphibious warfare ships, and 46 combat logistics and support ships (see Table 2). Taking into account the projected retirements of ships now in the fleet, those purchases would allow the Navy to maintain a fleet of 306 ships or more beginning in 2022 and for most years thereafter through the end of the period.<sup>4</sup> CBO estimates that the Navy's current plan would cost \$21 billion per year, on average, for the next 30 years.<sup>5</sup>

Such a large shipbuilding budget over a span of three decades has no historical precedent. In constant 2014 dollars, average annual spending over the past decade has been about \$14 billion; the annual average for the past 30 years has been roughly \$16 billion. Those figures

suggest, and the Navy's report explicitly states, that the Navy will find it difficult at best to fully implement its current shipbuilding plan, particularly if the budget for the Department of Defense continues to be subject to significant constraints.

## Shipbuilding Under Smaller Budgets

CBO analyzed possible changes in the composition of the Navy's fleet that would be required under various shipbuilding budgets. For this analysis, CBO chose three basic annual amounts, all in 2014 dollars and each resulting in a smaller fleet than the Navy currently envisions:

- \$16 billion (the average ship construction budget over the past 30 years),
- \$14 billion (the average ship construction budget for the past 10 years), and
- \$12 billion (the average ship construction budget during the 1990s).

CBO's analysis incorporates the assumption that reductions in shipbuilding relative to the Navy's 2015 plan would be distributed in rough proportion to current numbers of major battle force ships: aircraft carriers, large and small surface combatants, submarines, and amphibious warfare ships. The number of combat logistics and support ships also would be reduced, although by smaller

4. For more information, see Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2015 Shipbuilding Plan* (December 2014), [www.cbo.gov/publication/49818](http://www.cbo.gov/publication/49818), and *An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan* (October 2013), [www.cbo.gov/publication/44655](http://www.cbo.gov/publication/44655). The 2014 and 2015 shipbuilding plans are similar, although the Navy changed the way it counts battle force ships for the 2015 plan. The changes affect a small number of ship classes designated as very small combatants or logistics and support ships. This report relies on the counting rules used for 2014 and earlier plans. CBO discusses the new rules on page 8 of its report on the 2015 plan. In the 2015 National Defense Authorization Act, the Congress directs the Navy to generally rely on the prior counting rules in formulating its future shipbuilding plans.

5. That amount covers everything that the Navy pays for from its shipbuilding accounts, including construction of new ships, refueling of nuclear-powered aircraft carriers, ship conversions, construction of training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment needed to operate a ship but not necessarily provided by the manufacturing shipyard), and other smaller items.

**Table 2.****CBO's Projections of Purchases and Costs of New Battle Force Ships Under Alternative Shipbuilding Budgets, 2015–2044**

	Navy's 2015 Plan (\$21 Billion) <sup>a</sup>	Average Annual Shipbuilding Budget		
		\$16 Billion	\$14 Billion	\$12 Billion
Number of Ships Purchased				
Combat Ships				
Aircraft carriers	6	5	4	3
Ballistic missile submarines	12	10	8	6
Attack submarines	48	31	29	27
Destroyers	65	48	41	31
Littoral combat ships	66	47	44	39
Amphibious warfare ships	21	15	12	10
Subtotal	218	156	138	116
Combat Logistics and Support Ships	46	41	37	33
<b>Total</b>	<b>264</b>	<b>197</b>	<b>175</b>	<b>149</b>
Cost (Billions of 2014 dollars)				
Combat Ships				
Aircraft carriers	76	63	57	43
Ballistic missile submarines	92	83	69	54
Attack submarines	144	95	89	84
Destroyers	144	109	91	75
Littoral combat ships	35	25	24	21
Amphibious warfare ships	53	37	31	25
Subtotal	544	412	361	302
Combat Logistics and Support Ships	23	22	20	18
Other Items <sup>b</sup>	55	49	41	39
<b>Total</b>	<b>621</b>	<b>483</b>	<b>422</b>	<b>359</b>

Source: Congressional Budget Office.

Note: CBO's analysis includes the assumption that, under all three budget plans, the Navy would buy ships of each type in roughly the same proportion as it would under its 2015 plan.

- a. CBO estimates that the Navy's fiscal year 2015 shipbuilding plan would require an average budget of \$21 billion per year over the 2015–2044 period. See Congressional Budget Office, *An Analysis of the Navy's 2015 Shipbuilding Plan* ([www.cbo.gov/publication/49818](http://www.cbo.gov/publication/49818)). The Navy estimates that its 2015 shipbuilding plan would cost an average of \$19 billion per year. That amount covers everything that the Navy pays for from its shipbuilding accounts, including construction of new ships, refueling of nuclear-powered aircraft carriers, ship conversions, construction of training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment needed to operate a ship but not necessarily provided by the manufacturing shipyard), and other smaller items.
- b. Other items include funding for refueling nuclear-powered aircraft carriers and the costs of various items that the Navy purchases from its shipbuilding account.

**Table 3.****Inventory of Battle Force Ships and Fleet Composition in Selected Years Under Alternative Shipbuilding Budgets**

	Navy's 2015 Plan				\$16 Billion Budget				\$14 Billion Budget				\$12 Billion Budget			
	2014	2024	2034	2044	2014	2024	2034	2044	2014	2024	2034	2044	2014	2024	2034	2044
<b>Inventory of Battle Force Ships</b>																
Combat Ships																
Aircraft carriers	10	12	11	10	10	11	11	9	10	11	11	8	10	11	10	7
Ballistic missile submarines	14	14	10	12	14	14	8 †	10	14	14	8	8	14	14	7	6
Attack submarines	54	48	46	52	54	48	39	39	54	48	37	37	54	47	36	35
Guided missile submarines	4	4	0	0	4	4	0	0	4	4	0	0	4	4	0	0
Large surface combatants	85	98	86	83	85	90	72	70	85	89	69	64	85	87	59	55
Small surface combatants and mine countermeasures ships <sup>a</sup>	26	41	52	52	26	35	43	37	26	35	42	32	26	35	39	27
Amphibious warfare ships	31	34	34	31	31	33	31	27	31	33	29	26	31	33	29	25
Subtotal	224	251	239	240	224	235	204 †	192	224	234	196	175	224	231	180	155
Combat Logistics and Support Ships	57	62	64	63	57	64	62	59	57	64	62	55	57	64	59	53
<b>Total</b>	<b>281</b>	<b>313</b>	<b>303</b>	<b>303</b>	<b>281</b>	<b>299</b>	<b>266 †</b>	<b>251</b>	<b>281</b>	<b>298</b>	<b>258</b>	<b>230</b>	<b>281</b>	<b>295</b>	<b>239</b>	<b>208</b>
<b>Composition of Battle Force Fleet (Percent)</b>																
Combat Ships																
Aircraft carriers	4	4	4	3	4	4	4	4	4	4	4	3	4	4	4	3
Ballistic missile submarines	5	5	3	4	5	5	3	4	5	5	3	3	5	5	3	3
Attack submarines	19	16	16	17	19	16	15	16	19	16	14	16	19	16	15	17
Guided missile submarines	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
Large surface combatants	30	29	26	27	30	30	27	28	30	30	27	28	30	29	25	26
Small surface combatants and mine countermeasures ships <sup>a</sup>	9	13	18	17	9	12	16	15	9	12	16	14	9	12	16	13
Amphibious warfare ships	11	11	11	10	11	11	12	11	11	11	11	11	11	11	12	12
Subtotal	80	79	78	79	80	79	77	76	80	79	76	76	80	78	75	75
Combat Logistics and Support Ships	20	21	22	21	20	21	23	24	20	21	24	24	20	22	25	25
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Congressional Budget Office. [† On March 17, 2015, CBO corrected this number to increase it by 1.]

a. Small surface combatants and mine countermeasures ships include littoral combat ships, Oliver Hazard Perry class FFG-7 frigates, and Avenger class mine countermeasures ships.

percentages. Many of those ships (except oilers) are small and comparatively inexpensive, and their number is not tied directly to the size of the overall fleet. Thus, CBO did not reduce the number of support ships by the same proportion that it reduced the number of combat ships for each budget amount.

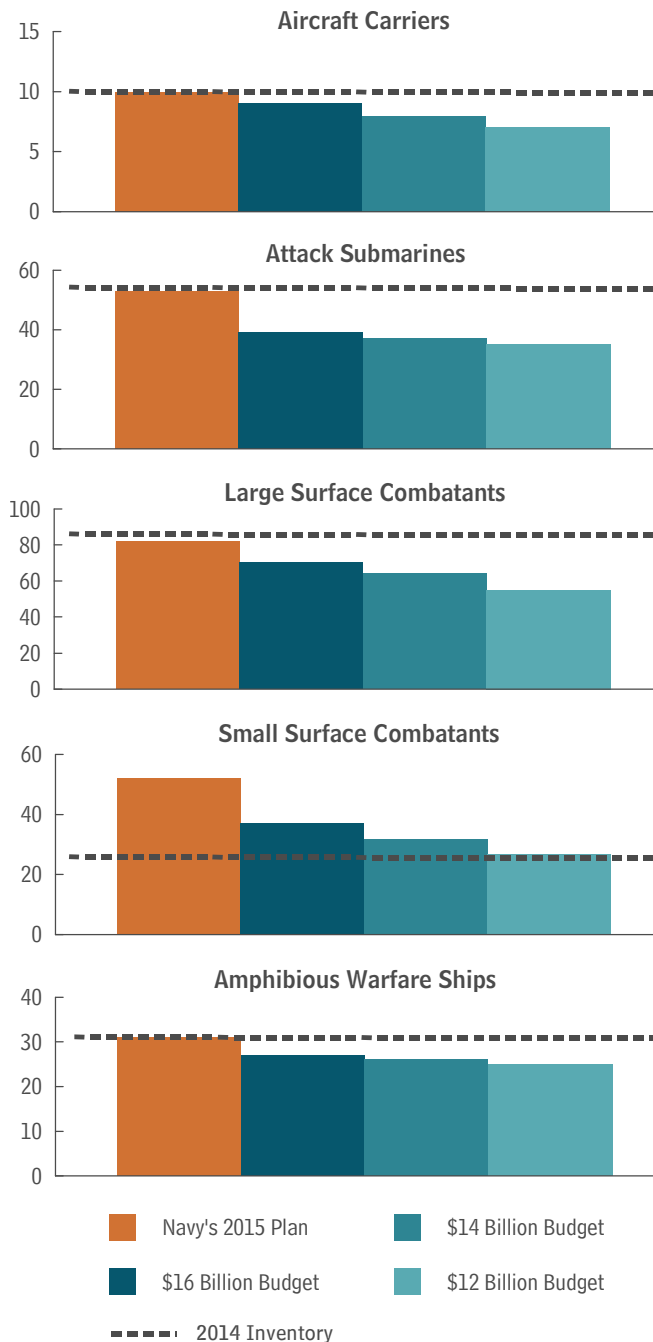
### What Would Smaller Shipbuilding Budgets Buy?

With an average annual budget of \$16 billion, the largest of the three amounts considered for this report, CBO estimates that the Navy would purchase 197 battle force ships over the next 30 years—67 fewer than the Navy's

2015 plan calls for. Nearly all of the difference in inventories would come in the second and third decades.

Under a \$16 billion plan, the fleet would decline gradually from its current 281 battle force ships to 251 ships by 2044—17 percent fewer than the 303 ships envisioned for that year in the Navy's 2015 plan (see the top panel of Table 3 and Figure 1).

In CBO's analysis, the composition of the fleet (that is, the percentage share for each type of vessel) in 2044 under the \$16 billion budget would closely resemble the composition proposed in the Navy's 2015 plan (see the

**Figure 1.****Inventories of Selected Ship Types Under Various Annual Shipbuilding Budgets, 2044**

Source: Congressional Budget Office.

bottom panel of Table 3). (CBO assumes that the various ship programs would be cut roughly, but not precisely, by equal proportions.) The largest difference for combat ships would be in the numbers of small surface combatants and mine countermeasures ships, which would

account for a share of the fleet that is 2 percentage points smaller than under the Navy's plan. A \$16 billion budget would result in a 3 percentage-point increase in the share of combat logistics and support ships. (In CBO's analysis, the percentage of support ships generally increases slightly under all three alternative budgets.)

If the Navy was allocated a \$14 billion annual budget for shipbuilding, CBO projects, it could purchase 175 battle force ships, 34 percent fewer than would be purchased under the Navy's 2015 plan. As would be the case for the \$16 billion annual budget, in the first decade for this plan, the fleet's composition would be largely similar to that under the Navy's 2015 plan. By 2044, however, the fleet would number 230 ships—24 percent fewer than the number envisioned for that year in the Navy's 2015 plan. Under CBO's assumptions, its composition would be virtually the same as that under the \$16 billion budget.

With an average annual budget of \$12 billion, CBO projects, the Navy could purchase 149 battle force ships, 44 percent fewer than under the Navy's 2015 plan. That fleet would be slightly smaller in the first decade than under the other two scenarios, and by 2044, the inventory would number 208 ships, 31 percent fewer than under the Navy's 2015 plan.

### What Would Be the Policy Implications of Smaller Budgets?

Although they would bring the Navy's shipbuilding plan into closer alignment with historical funding, smaller fleets would pose risks that cannot be addressed by maintaining the Navy's forward presence. The Navy would probably have insufficient forces to implement its current wartime plans (which are described only in classified documents). In particular, under each budget amount, the Navy would have fewer ships of all types available to reinforce its fleet in combat for the duration of a conflict. Similarly, smaller fleets would be placed under greater stress in a long crisis that was not a war: If the international environment required the presence of a larger naval force beyond the normal forward presence force for a long time, smaller fleets would struggle more to provide that presence without overtaxing the ships' crews.

CBO's analysis did not include an assumption that the fleets that would be affordable under smaller budgets would forgo certain missions or perform them differently—although those are probable outcomes of smaller

shipbuilding budgets. Under such budgetary constraints, the Navy could make choices that are entirely different from the proportionate reductions CBO assumed, doing less overall or emphasizing some types of ships over others to better match its forces to changing demands or war-time priorities. If the Navy was substantially smaller, policymakers in the United States might decide to place more or less emphasis on certain regions, perhaps changing the fleet's composition as a result. A smaller fleet also might cause military leaders to adopt strategies or tactics for achieving objectives different from those that they might pursue with a larger fleet; such differences also could affect the fleet's composition. Thus, for example, it might be argued that if the United States can afford only a small Navy, the fleet should have more submarines relative to aircraft carriers or surface ships because submarines are difficult to detect and can effectively impede another navy's control of the seas.

Some observers have recommended that the Navy increase its reliance on a larger number of smaller ships that are closely networked electronically. In that case, the Navy might purchase ships and have fleets that are markedly different from those considered in this analysis.

### **What Would Be the Implications for the Shipbuilding Industry?**

Although CBO did not specifically analyze the potential effects on naval shipyards, shipbuilding clearly would be curtailed under smaller budgets. Hundreds of companies contribute to the shipbuilding effort at the five large shipyards that produce the Navy's aircraft carriers, large surface combatants, submarines, amphibious warfare ships, and support ships and at the two smaller yards that produce littoral combat ships and small support ships. Those seven shipyards build few ships for the private sector. If funding was increased from its recent levels as envisioned under the Navy's plan, the shipyards' infrastructure could accommodate the resulting increase in orders, and the number of workers would need to increase. In contrast, if spending was less than that in recent years, fewer jobs would be available in the shipyards and related businesses.

There is a tension in determining the most efficient industrial base for shipbuilding. On the one hand, when a given shipyard produces more ships, per-ship overhead

costs should decline and workers' skills should increase with each additional unit. On the other hand, if, under smaller shipbuilding budgets, orders were consolidated at fewer yards to preserve efficiency and, as a result, some shipyards closed, there would be less opportunity for competition to reduce the costs.

Over the past decade, the Navy has spent about \$14 billion annually to build, on average, 7.7 ships per year. During that time, one major shipyard closed so that its parent company could consolidate its shipbuilding business at another yard to improve efficiency. Under each of the three budget scenarios, rising average costs per ship would reduce average annual ship purchases to 6.5 ships under the \$16 billion budget, 5.8 ships under the \$14 billion budget, and 5.0 ships under the \$12 billion budget—or fewer than one ship per yard per year if all seven yards continued to receive orders from the Navy.

CBO's analysis incorporates the assumption that yards would be closed as needed to produce ships efficiently. Under the \$16 billion budget, by the mid-2020s one or two large shipyards and one small shipyard would stop receiving Navy orders. Under the \$12 billion budget, two or three large shipyards and one small shipyard probably would stop receiving orders from the Navy. One yard would produce all of the Navy's destroyers if just one was purchased each year for a long period, as would be the case under the \$12 billion budget.

CBO's cost analyses incorporate those changes to the extent that the closing of one or more shipyards would affect production rates (and purchase prices) at another shipyard. If the Navy continued to enlist all existing yards in the naval shipbuilding business, costs for each ship would be higher than CBO estimates and the Navy would be able to purchase fewer ships under each budget amount unless savings from competition equaled or exceeded the savings from having some yards produce a larger number of ships.

### **Maintaining a Forward Presence With a Smaller Fleet**

The Navy routinely deploys slightly more than one-third of its total fleet overseas. In Congressional testimony, Navy officials stated that the service has about 100 ships

**Figure 2.**  
**Current and Notional Operating Cycles for a Nuclear-Powered Aircraft Carrier**

Fleet Response Plan (2013)				
Maintenance	Training	Deployment	Sustainment	
32 Weeks	47 Weeks	30–43 Weeks	17–30 Weeks	
Total Cycle: 139 Weeks (32 months)				

Optimized Fleet Response Plan (2015 and Beyond)			
Maintenance	Training	Deployment	Sustainment
26 Weeks	30 Weeks	35 Weeks	65 Weeks
Total Cycle: 156 Weeks (36 months)			

Enhanced Carrier Presence Plan (CBO Alternative Based on Earlier Navy Proposal)				
Maintenance	Training	Deployment	Dwell	Deployment
35 Weeks	30 Weeks	26–30 Weeks	31–39 Weeks	26–30 Weeks
Total Cycle: 156 Weeks (36 months)				

Forward Deployed Naval Force (Japan-Based Carrier) <sup>a</sup>		
Maint.	Deployment	
17 Weeks	35 Weeks	
Total Cycle: 52 Weeks (12 months)		

Source: Congressional Budget Office based on data from the Navy.

Note: A ship is considered to be in *sustainment* if it is able to put to sea and go on deployment within a short period. Under the Enhanced Carrier Presence Plan, when a ship is in its *dwell* phase between deployments, it mostly remains in its home port to allow its crew members to rest and spend time with their families.

a. The aircraft carrier in this example is currently based in Japan. It is the Navy’s only overseas-based aircraft carrier, and it is considered to be deployed and available to perform missions when it is not in maintenance, even if it is in its home port.

deployed and operating overseas.<sup>6</sup> Until recently, ships generally deployed with a single crew for 6 or 7 months in a 24- to 32-month operating cycle. (Ships’ assignments at sea are limited to the period that the Navy allows a crew to be deployed and away from home—called personnel tempo, or PERSTEMPO.) Cycles consist of phases for maintenance, training in two phases, and deployment, along with a sustainment period during

6. Testimony of Jonathan Greenert, Chief of Naval Operations, U.S. Navy, before the Subcommittee on Defense of the Senate Committee on Appropriations, *FY 2016 Department of the Navy Posture* (March 4, 2015), <http://go.usa.gov/3awCY>.

which a ship may be at its home port but available to deploy quickly. The length of the cycle, which has varied over time, depends on the type of ship. Until recently, aircraft carriers followed a 32-month operating cycle, up from 27 months about a decade ago. Surface combatants and amphibious warfare ships followed a 27-month cycle. Attack submarines continue to follow a 24-month cycle. Late last year, the Navy began to phase in its Optimized Fleet Response Plan, which eventually will have all major surface ships deploy for up to 8 months in a 36-month cycle. (Various operating cycles for aircraft carriers are illustrated in Figure 2.)

**Table 4.****Major Deployments of U.S.-Based Combat Ships, 2007–2013**

	Aircraft Carriers	Attack Submarines	Large Surface Combatants	Small Surface Combatants <sup>a</sup>	Amphibious Warfare Ships
Total Number of Deployments	30	125	236	112	87
Number of Deployments by Length					
6 months or longer	23	113	198	81	62
7 months or longer	16	15	111	14	46
8 months or longer	4	2	26	2	10
Average Length of Deployment (Days)	191	179	190	172	181
Deployments of the Same Ship in Consecutive Years	15	21	76	57	41
Average Number of Ships in the Navy's Inventory	10	51	71	30	28

Source: Congressional Budget Office based on data from the Department of the Navy.

Note: Excludes ships that operate from overseas bases, such as Japan or Guam, as well as ballistic missile submarines, guided missile submarines, and mine countermeasures ships.

a. Small surface combatants are Oliver Hazard Perry class FFG-7 frigates.

Single-crewed ships based in the continental United States provide the bulk of the Navy's deployments, but the Navy has used three techniques during the past several decades to sustain or increase its forward presence:

- Deploying ships for longer periods,
- Basing more ships and their crews overseas, and
- Assigning more than one crew to some ships that operate from an overseas port or from a port in the continental United States.

Crew members' families typically live where a ship is based—at the ship's official home port. If a ship operates from and receives maintenance at an overseas port but has a U.S. home port, families reside in the United States.

### Increasing the Length and Frequency of Deployments

The Navy can increase its forward presence most quickly by boosting the frequency or the duration of ships' deployments, as it has in the recent past. Under normal peacetime operations in the 1990s, ships were deployed for 6 months about every two years. However, between 2007 and 2013 (the period for which CBO has data), nearly half of all deployments of the Navy's aircraft

carriers, large surface combatants, and amphibious warfare ships lasted at least 7 months (see Table 4). Furthermore, a substantial number of surface ships are now deployed every year, rather than once in a cycle of 24 to 32 months, although some of those deployments are for periods of only 2 or 3 months each.

The principal advantage of instituting more frequent or longer deployments is that such a change is relatively quickly and easily accomplished. Ships need not carry additional supplies, for example, because they generally are resupplied at sea or in overseas ports. If it is known in advance that a deployment will be longer than normal, the Navy could plan for additional maintenance; ordinarily, little other additional preparation is necessary.

The disadvantages include the stress borne by crew members and their families and the potential for accelerated deterioration of the ships, especially if longer deployments become routine. If deployments commonly last longer than six months, recruitment and reenlistment—particularly among sailors with specialized or difficult-to-replace skills—could suffer. For that reason, the Navy has tried to keep most deployments of attack submarines to six months. Submariners constitute a relatively small proportion of the total sailing force, but they are among the most highly skilled—they are trained to operate and



maintain nuclear-powered ships—and the Navy makes extra efforts to retain them.

Despite those concerns, the extent to which more frequent and longer deployments affect reenlistment has not been studied extensively. A recent analysis of data from 2008 to 2013 for 11 Navy ships—6 deployed for six months each and 5 deployed for longer periods—showed no substantial difference in retention among sailors in either group.<sup>7</sup>

Overall retention data do not provide a clearer picture. Retention for the attack submarine force, for example, is higher than the Navy average, but submarines generally are not deployed for more than six months at a time. Conversely, although half of all large surface combatant deployments from 2007 to 2013 were at least seven months long, retention among sailors on those ships was above the Navy's average and nearly the same as that among the submarine crews. Deployments of the aircraft carrier force were as long as those for the surface combatant force, yet retention among those sailors was below average in every year for the period. And the amphibious force, which consistently has the longest deployments, had below-average retention for three of the six years but above-average retention for the other three years.

Surveys of sailors indicate anecdotally that their primary concern for reenlistment is not the length of deployment as such, but the lack of predictability. In the past, most deployments of longer than 7 months were unscheduled, and sailors learned of them only after they were at sea.<sup>8</sup> To address that difficulty, early in 2014 the Navy unveiled its Optimized Fleet Response Plan, which would change the operating cycle for all surface warships. By

having one deployment of up to 8 months out of a 36-month cycle, the new cycle—which the Navy has recently implemented for aircraft carriers and surface combatants—will provide more predictability and stability in crew deployments. Previous cycles had carriers and surface ships deployed for 6 to 7 months out of 32, but over the past two years, ships increasingly have been deployed for longer periods.<sup>9</sup> If the Navy adheres to the new cycle and the schedule it implies, sailors will be deployed for less time, on average, than they have been in recent years, when many have been at sea for longer than 7 months at a time. The disadvantage is that, at 8 months, deployments typically will be scheduled for a month longer than they have been in the past. The Navy's Fleet Forces Command considers that the new operating cycle defines the limit on the demands that can be placed on ships' crews without undermining the service's ability to retain experienced sailors. Deployments of 8 months out of 36 provide almost the same forward presence as that provided by deployments of 7 months out of 32.

Although it is commonly assumed that ships that are deployed routinely for longer periods will require more maintenance, there is not much evidence either to support or to refute that belief. According to a study published by the CNA Corporation, failure to perform adequate maintenance would shorten the service life of surface ships.<sup>10</sup> However, that conclusion does not mean that lengthier deployments will require maintenance in excess of what otherwise would be scheduled. One assumption that is incorporated into CBO's analysis is that there is a direct relationship between the amount of time spent on deployment and the costs of maintenance. For example, amphibious warfare ships currently spend about one day in maintenance for every three days' deployment. Under the alternative approaches discussed in the final section of this report, CBO estimates the costs

7. Department of the Navy, information supplied to CBO staff (April 23, 2013).

8. According to a recent report, "Analysis predicts that extended and additional deployments will negatively impact personnel retention rates." See Office of the Chief of Naval Operations, *Naval Vessels and the Force Structure Assessment*, Report to Congress (July 2014), p. 7. Although that report does not discuss or cite the particular analysis, in communications with CBO, the Navy indicated that its assessment was based on information from a report that longer and more frequent deployments resulted in reenlistment rates that were between 1.2 and 1.9 percentage points below those otherwise observed. See Heidi L.W. Golding and Henry S. Griffis, *How Has PERSTEMPO's Effect on Reenlistments Changed Since the 1986 Navy Policy?* (CNA Corporation, July 2004), <http://tinyurl.com/lp2xonr>.

9. Bill Gortney, "Optimizing the Fleet Response Plan" (Navy briefing, January 14, 2014); Sam Fellman, "Navy's New Plan Aims to Lock in 8-Month Carrier Deployments," *Navy Times* (January 15, 2014), <http://tinyurl.com/nh2ktwv>; and Marcus Hitchcock, "Optimizing the Fleet Response Plan" (Navy briefing to CBO staff, February 7, 2013). The Navy has described the lengths of deployments under the Optimized Fleet Response Plan as lasting "up to 8 months"; CBO used that deployment period for this report. See Bill Gortney and Harry Harris, "Applied Readiness," *Proceedings Magazine*, vol. 140, no. 10, p. 1340 (October 2014), <http://tinyurl.com/npxphma>.

10. Wm. Brent Boning, *Ship Depot Maintenance and Expected Service Life* (CNA Corporation, February 2013).



for maintaining amphibious warfare ships at that rate regardless of whether the additional time is the result of a longer deployment with single or multiple crews. The same types of assumptions were applied to all cases in which deployments were anticipated to exceed those of the Navy's current plan or the Navy's Optimized Fleet Response Plan.

### Basing More Ships Overseas

Much more forward presence is possible when ships are based overseas or operated from overseas bases than is possible if those ships are based in the United States.<sup>11</sup> When a ship is already overseas, no time is required for transit. (In many cases, it can take from one to five weeks to sail from a U.S. base to an overseas operating area and the same amount of time to return home.) Because of this, unless they are in maintenance, ships based overseas are considered to be on deployment even when they are in their home ports. With their different operating cycles, such ships can spend more time at sea conducting missions and still meet the guidelines for the period a crew is permitted to be away from its home port. A ship that is based in Japan, for example, can triple its forward presence compared with the amount it would supply if based in the continental United States.<sup>12</sup>

Since the end of World War II, the Navy has based a portion of its fleet outside the continental United States and Hawaii. At the end of 2013, the Navy had 29 ships, or about 10 percent of its fleet, stationed overseas (see Table 5). The largest concentration is in Japan, which is home to a carrier strike group consisting of one nuclear-powered aircraft carrier and nine cruisers and destroyers, and another group of amphibious warfare ships, consisting of one large amphibious assault ship and three smaller amphibious transport docks or dock landing ships. One command ship and four mine countermeasures ships also are based in Japan. In 2013, the Navy also had ships stationed in the U.S. territory of Guam, at the leased island of Diego Garcia (in the Indian Ocean), in Bahrain, and in Italy.

Over the next decade, the Navy plans to increase to 44 the number of ships based overseas. Four destroyers are scheduled to operate from Spain by the end of 2015 (2 were transferred in 2014; 2 will be transferred this year), and 16 littoral combat ships will ultimately operate from overseas bases (8 to replace retiring mine countermeasures ships, and 8 to be added to the Navy's overseas fleet). The Navy also announced in April 2013 that it would transfer one additional attack submarine to Guam in 2015.<sup>13</sup> More recently, the Navy announced it would base two additional destroyers in Japan—one in 2015 and one in 2017.

The major impediment to overseas basing is in obtaining permission from host governments; basing agreements for existing ships are renegotiated periodically, sometimes resulting in fewer ships' being based overseas or leading to higher costs. For example, in response to a report released in August 2012 by the Center for Strategic and International Studies, the government of Australia explicitly rejected the center's suggestion that the United States base aircraft carriers in that country.<sup>14</sup> And even if agreements are reached, changes in a foreign government's priorities can end a long-standing overseas-basing arrangement, as was the case for U.S. naval and air bases in the Philippines in the early 1990s. Political constraints are less likely to affect overseas bases in a U.S. territory, such as Guam, or at a leased location, such as Diego Garcia.

The expense of operating overseas presents another area of difficulty. For example, some initial investment is necessary to set up support facilities, and costs can vary widely depending on the number and type of ships at a base and whether infrastructure is already available. In addition, ships cost more to operate from an overseas base: Sea pay, fuel, and maintenance costs are higher, for example, because ships based overseas usually spend more time at sea than ships based in the United States. The Navy estimates that the annual cost of operating a ship based in Japan is about 20 percent greater than the cost of operating a U.S.-based ship. That expense could be

11. Sailors assigned to ships *based* overseas may have their families accompany them; those assigned to ships *operated* overseas do not.

12. See, for example, Congressional Budget Office, *An Analysis of the Navy's Amphibious Warfare Ships for Deploying Marines Overseas* (November 2011), Box 2, [www.cbo.gov/publication/42716](http://www.cbo.gov/publication/42716).

13. Gaynor Dumat-ol Daleno, "4th Submarine to Be Deployed," *Pacific Daily News* (April 11, 2013), <http://tinyurl.com/lpabpq4>.

14. See Rod McGuirk, "Australia Rejects Proposal to Base U.S. Carrier," *Navy Times* (August 2, 2012), <http://tinyurl.com/mug2c7y>; and David J. Berteau and others, *U.S. Force Posture Strategy in the Asia Pacific Region: An Independent Assessment* (Center for Strategic and International Studies, August 2012), <http://tinyurl.com/bbhaphg>.

**Table 5.****Number of Battle Force Ships Operating From Overseas Bases, by Location and Type**

	2013	2024 (Projected)
Japan		
Aircraft carriers	1	1
Cruisers and destroyers	9	11
Amphibious ships	4	4
Command ships	1	1
Mine countermeasures ships <sup>a</sup>	4	n.a.
Littoral combat ships <sup>b</sup>	n.a.	4
Subtotal	19	21
Guam		
Attack submarines	3	4
Fleet tender	1	1
Subtotal	4	5
Bahrain		
Mine countermeasures ships <sup>a</sup>	4	n.a.
Littoral combat ships <sup>b</sup>	n.a.	8
Subtotal	4	8
Italy		
Command ships	1	1
Diego Garcia		
Fleet tender	1	1
Spain		
Destroyers	0	4
Singapore		
Littoral combat ships <sup>b</sup>	n.a.	4
<b>Total</b>	<b>29</b>	<b>44</b>

Source: Congressional Budget Office based on data from the Department of the Navy.

Notes: For its 2015 shipbuilding plan, the Navy changed the rules for counting battle force ships. Under that plan, small patrol craft based in Bahrain are counted in the battle force, but the same patrol craft based in the United States are not. In 2013, the Navy had four patrol craft based in Bahrain. Patrol craft are excluded from this table because in 2013 they were not counted as part of the Navy's battle force and by 2025 all patrol craft will have been retired from the fleet.

n.a. = not applicable.

a. All mine countermeasures ships will be retired by 2024.

b. In 2013, the Navy had no littoral combat ships based overseas.

justified by the threefold increase in forward presence, however, and in some cases the costs are offset by support from the host country; the government of Japan contributes substantially to the support of U.S. military bases located there.<sup>15</sup>

Basing ships overseas also changes economic activity in the United States, thus creating an indirect cost.

Typically, crew members' families live where a ship is based, and much of the economic activity that comes from maintaining ships overseas (purchases of food, fuel,

15. Michael J. Lostumbo and others, *Overseas Basing of U.S. Military Forces: An Assessment of Relative Costs and Strategic Benefits* (RAND Corporation, 2013), pp. 143–149, [www.rand.org/pubs/research\\_reports/RR201.html](http://www.rand.org/pubs/research_reports/RR201.html).

and some repair activities) and some of the families' household spending would occur in and benefit host countries. When ships are based in the United States, such economic activity stays in the area around the ships' home ports.

### Rotating Crews

The third and most technically challenging method that the Navy uses to increase its forward presence is to rotate crews on and off its ships, whether they are based in the United States or operating from overseas ports.<sup>16</sup> The Navy currently employs various crewing arrangements and has experimented with others. The standard model has a single crew that stays with a ship during the maintenance, training, and deployment phases of the operating cycle. In other cases, two or more crews can be assigned to a single ship. For example, since the early 1960s, the Navy's ballistic missile submarines have been staffed by dual crews.<sup>17</sup> Thus, on today's Ohio class submarines, a pair of crews—designated blue and gold—alternates in deployments of two and a half months, with an intervening maintenance period of about a month per rotation. The Navy has adapted that construct for other ships in the fleet (see Table 6). The length of deployment varies by ship class, but the result is the same: When crews alternate and maintenance time is shared, a ship can provide more forward presence than is possible with a single crew.

Another approach is a multiple-crewing arrangement in which crews rotate among ships of the same class; thus, one crew could staff a different ship each time it goes to sea. The Navy has used such rotations for its coastal patrol ships and some of its mine countermeasures ships. In the 2000s, the Navy conducted three multiple-crewing experiments—known as the Sea Swap—on Spruance and Arleigh Burke class destroyers. (Despite the project's name, however, the crews were swapped in port rather than at sea.) The experiments consisted of keeping one ship deployed overseas while rotating the crews of two or three other ships to that one.<sup>18</sup> The Navy concluded that the tests were a success, although the Government Accountability Office criticized their management,

particularly concerning the collection of evaluation data.<sup>19</sup> The Navy plans to change its rotation for its newly deployed littoral combat ships from a dual-crew arrangement in which the U.S.-based crews swap overseas to what is known as the 3.2.1 concept: Three U.S.-based crews operate two ships, one of which is deployed overseas at all times.

In general, a rotation that involves more crews than ships will produce more forward presence than is possible with rotations that use equal numbers of crews and ships. Swapping the crews at overseas ports boosts the Navy's forward presence by reducing transit time to and from ports in the United States, but it requires appropriate infrastructure overseas to support crew exchanges and regular maintenance. Although the exact amount of additional presence depends on the method of crew rotation, CBO's analysis indicates that a dual- or multiple-crewed ship can provide between 1.4 times and 1.8 times the amount of presence that a single-crewed ship will provide and about half of what a ship with a home port overseas would provide.<sup>20</sup>

Nevertheless, crew rotation also poses several challenges. For much of its history, the Navy's culture has fostered strong identification of a crew with its ship: A single crew trains on, operates, maintains, and lives for significant periods on a single vessel. Crew members often take considerable pride in serving on and maintaining a ship, and some sense of ownership can be lost if a ship has more than one crew. One result could be a loss in efficiency in maintenance. If a repair is required close to the time of a switch, for example, the current crew could leave the work to the next crew to accomplish. If a ship has a single crew, its members have no such option, and they could

16. For a more detailed discussion, see Congressional Budget Office, *Crew Rotation in the Navy: The Long-Term Effect on Forward Presence* (October 2007), [www.cbo.gov/publication/19283](http://www.cbo.gov/publication/19283).

17. Jessica Taylor, "USS *George Washington* (SSBN-598): The Nation's First Boomer," *Undersea Warfare* (Winter 2009), <http://go.usa.gov/fA2x>.

18. See Congressional Budget Office, *Crew Rotation in the Navy: The Long-Term Effect on Forward Presence* (October 2007), pp. 5–9, [www.cbo.gov/publication/19283](http://www.cbo.gov/publication/19283).

19. Government Accountability Office, *Ship Rotational Crewing Initiatives Would Benefit From Top-Level Leadership, Navy-Wide Guidance, Comprehensive Analysis, and Improved Lessons-Learned Sharing*, GAO-08-418 (May 2008), [www.gao.gov/products/GAO-08-418](http://www.gao.gov/products/GAO-08-418).

20. Congressional Budget Office, *Crew Rotation in the Navy: The Long-Term Effect on Forward Presence* (October 2007), [www.cbo.gov/publication/19283](http://www.cbo.gov/publication/19283); and *Increasing the Mission Capability of the Attack Submarine Force* (March 2002), [www.cbo.gov/publication/13538](http://www.cbo.gov/publication/13538).

**Table 6.****The Navy's Continuing Operations and Past Experience With Crew Rotation, by Ship Class**

	Number of Ships	Number of Crews	Rotation Type	Rotation Method
<b>Continuing Operations</b>				
Ohio Ballistic Missile Submarines	14	28	Dual Crew	Two crews assigned to a single ship alternate on deployment; the submarine returns to a U.S. port for maintenance and a change of crew.
Ohio Guided Missile Submarines	4	8	Dual Crew	Similar to the rotation system for ballistic missile submarines, deployments are longer and some maintenance and crew changes occur at overseas ports.
Littoral Combat Ships	3	6	Dual or Multiple Crew	Initially, two crews alternate in operating the ship and crew changes occur at an overseas port. The ships will be converted to a system of three crews for a pair of ships to keep one ship deployed at all times. Crew members live in the United States.
<b>Past Experience</b>				
Cyclone Coastal Patrol Ships	8	13	Multiple Crew	Before 2013, Bahrain was the home port for five ships; three were based in the United States. The 13 crews lived in the United States and rotated between deploying to the ships and Bahrain and training on the ships in the United States. In 2013, the ships were converted to single crews and all now have a home port in Bahrain, where the crews also live.
Avenger Mine Countermeasures Ships	9	9	Multiple Crew	Before 2013, Bahrain was home to four ships; five more were based in the United States. <sup>a</sup> The nine crews lived in the United States and rotated between deploying to the ships in Bahrain and training on the ships in the United States. The ships in Bahrain and the United States were converted to single crews in 2013 and have home ports with their crews in those two countries.

Source: Congressional Budget Office based on data from the Department of the Navy.

Note: With multiple crewing, several crews rotate among several ships. The number of crews and the ships may be the same or the number of crews may be larger.

a. Four other ships, each with a single crew, are based in Japan.

be more motivated to complete the work in a timely manner.

Shifting from single to multiple crewing requires different procedures, additional personnel, and probably additional maintenance, and it could lead to a shorter service life for a ship. Training programs would need to account for the fact that more than one crew would operate a ship. Having additional crews would not only require the additional personnel to form the crew itself but would require additional trainers and recruiters as support personnel. Maintenance and repair costs also would increase and service life could decrease as a result of longer periods of operation. For example, if nuclear-powered submarines were deployed for longer periods, their power plants and pressure hulls would wear out faster, those ships' normally fixed service lives could be shortened, and they would need to be replaced sooner than the Navy envisions under its current shipbuilding plans.

The Navy also would need to change its support systems for ships and their crews by enhancing facilities and organizations to provide maintenance in short, high-intensity periods; by establishing training simulators and facilities to maintain crew proficiency; and by expanding organizations and facilities for recruitment and training of additional sailors. (The Navy accomplishes all of those tasks for its ballistic missile submarines.) The larger the ship, the greater those challenges are likely to be. Thus, crew rotation may not be a good choice for nuclear-powered aircraft carriers or large-deck amphibious assault ships, which have crews that number in the thousands and require significant shore-based infrastructure. (However, aircraft carriers and amphibious assault ships, which are among the most expensive ships in the Navy's fleet, could benefit from the efficiency offered by rotating crews.) For this report, CBO did not examine approaches that would use rotating crews on those ships.

## Analysis of Approaches to Maintaining a Forward Presence

CBO examined two approaches that the Navy might pursue to maintain or increase its current forward presence with a smaller fleet under three targets for the shipbuilding budget—\$16 billion, \$14 billion, and \$12 billion per year (see Table 1 on page 2):

- Under Approach 1, the Navy would either lengthen deployments or increase their frequency in an operating cycle so that smaller fleets matched the current forward presence in each of the main ship types (aircraft carrier, large surface combatant, attack submarine, and amphibious warfare ship). For this analysis, CBO assumed that there would be no difference from the Navy's current plans either in the number of ships based overseas or in the amount of rotational crewing used to staff certain ship classes.
- Under Approach 2, which would apply to the same four types of ships, there would be no deployments longer than six months, but more ships would be based overseas and more ships would use crew rotation.

Although it would be possible to blend various elements in any of several combinations, CBO structured its analysis to illustrate the trade-offs between long deployments and other methods of operation. The analysis shows that if the Navy lengthened deployments by 17 percent to 75 percent (depending on the ship type and the shipbuilding budget), it could maintain its current forward presence with fewer ships. Alternatively, by increasing the number of ships based overseas by 30 percent to 40 percent and by rotating crews on some or all of its large surface combatants, attack submarines, and amphibious warfare ships, the Navy could maintain the same amount of presence for each ship type without extending any deployments beyond six months.<sup>21</sup>

Each approach would involve greater operating costs for the ships and facilities affected by the changes in operating procedures. Those higher costs would offset some of the savings from reduced procurement budgets and from lower operation and support costs for a smaller fleet, and both approaches could pose drawbacks, including some involving recruitment and retention, as discussed earlier. Moreover, additional investment would be needed to build overseas bases and to establish dual or multiple crewing where it is not in use today. The introduction of rotating crews also could create new logistical and cultural challenges. Finally, although basing more ships overseas could provide assurance to U.S. allies and deter

21. Ballistic missile submarines are counted in the fleet inventories and as ships employing rotating crews, but they were not counted in the forward-presence calculations because their number at sea at any time is classified.

adversaries, it also might increase the fleet's vulnerability to attack.

### **Forward Presence Under an Annual Shipbuilding Budget of \$16 Billion**

Restricting the Navy's shipbuilding budget to the 30-year historical average would produce a fleet of 251 ships by 2044, CBO estimates. The Navy could maintain a forward presence of 113 ships—slightly more than the fleet provides today—either by using longer deployments for its aircraft carriers, large surface combatants (cruisers and destroyers), attack submarines, and amphibious warfare ships (Approach 1) or by using more overseas basing and rotation of crews on those ships (Approach 2).<sup>22</sup>

**Approach 1.** This approach would have the Navy use longer deployments for aircraft carriers, large surface combatants, attack submarines, and amphibious warfare ships, as follows:

- U.S.-based aircraft carriers would be deployed for 10 months in each 36-month operating cycle instead of the deployments of 8 months as specified under the Navy's Optimized Fleet Response Plan (see Figure 3).
- All U.S.-based large surface combatants (roughly three-fourths of such vessels; by 2044, all of them will be destroyers) would be deployed routinely for 10 months out of 36, longer than normal since 2012 for large surface combatants and even longer than the Navy currently plans for the future.
- Eighteen of the Navy's 39 attack submarines would be deployed for 7 months out of a 24-month cycle. Over the past several years, most attack submarines' deployments have been 6 months or shorter.
- All U.S.-based amphibious warfare ships (accounting for 85 percent of such vessels) would be deployed for 8 months out of 27. Since 2008, only a few deployments have lasted that long or longer, although they have become more common in recent years.

- All of the Navy's small surface combatants would be littoral combat ships, which, according to the Navy's plan, would use rotating crews. CBO's analysis considered no changes in the deployment of those ships.
- The number of combat logistics and support ships would remain about the same under the \$16 billion budget as it is for today's fleet. Each ship would spend about 70 percent of its time being operationally available, providing forward presence.
- The deployment cycles of all ships based overseas would remain unchanged.

**Approach 2.** Under this approach, the Navy could maintain the same forward presence as under Approach 1 by increasing the use of overseas basing and rotating crews, but limiting all deployments to six months (see Figure 4).

Additional ships based overseas would include an aircraft carrier, 4 large surface combatants (for a total of 19; the current plan calls for 15), 7 attack submarines (the current plan calls for 4; some of the additional submarines would go to Guam, others would be based with the second overseas carrier), and 2 amphibious warfare ships (for a total of 6). The number of ships using rotating crews also would increase. The attack submarine force would have 6 ships that adopted a modified version of the Navy's dual-crew system for ballistic missile submarines; all would continue to be based in the continental United States.<sup>23</sup> (Table A-1 in the appendix provides additional detail about the number of ships based overseas or having rotating crews at the end of 2013, under the Navy's 2015 plan, and under the two approaches discussed here.)

### **Forward Presence Under an Annual Shipbuilding Budget of \$14 Billion**

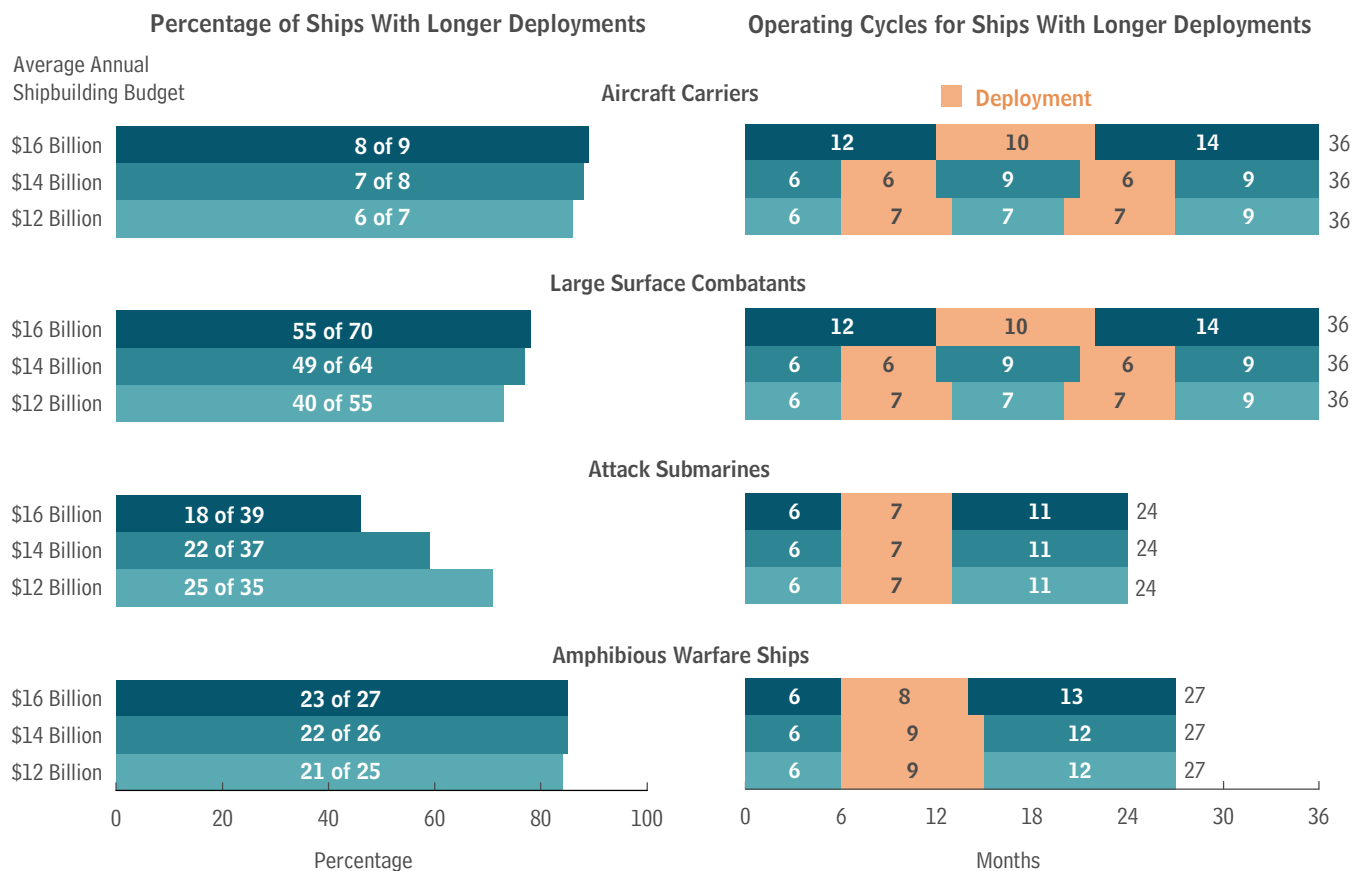
If the Navy's shipbuilding budget was limited to the amounts that the service has spent over the past decade (and currently plans to spend over the next five years, on average, under the Department of Defense's 2015 Future Years Defense Program), by 2044, the fleet would number 230 ships, 51 fewer than it has today and 73 fewer

22. The increase in forward presence from today's amount represents the greater forward presence provided by the larger number of littoral combat ships that would be serving in the fleet by 2044; there were just four such ships in 2014.

23. For a detailed discussion of how dual crews could be applied to attack submarines, see Congressional Budget Office, *Increasing the Mission Capability of the Attack Submarine Force* (March 2002), [www.cbo.gov/publication/13538](http://www.cbo.gov/publication/13538).

**Figure 3.**

### Deployments That Would Maintain the Same Amount of Forward Presence in 2044 as in 2013 With Smaller Fleets Than Under the Navy's Plan



Source: Congressional Budget Office.

Notes: CBO calculated the percentage of ships with longer deployments by using the Navy's inventory of ships based in the United States and overseas.

Under the Navy's current plan for forward presence, the overseas-based forces after 2044 would include 1 aircraft carrier, 15 large surface combatants, 4 attack submarines, and 4 amphibious warfare ships.

The aircraft carriers, large surface combatants, and eventually amphibious warfare ships would have one 8-month deployment over 36 months; attack submarines would have one 6-month deployment over 24 months. CBO's analysis included the assumption that the 36-month cycle would apply to aircraft carriers and surface combatants but the existing 27-month cycle would be retained for amphibious warfare ships.

When ships are not deployed, they are undergoing maintenance, their crews are in training, or they are in sustainment and ready for deployment on short notice.

than called for under its 2015 shipbuilding plan.<sup>24</sup> With a budget of \$14 billion, the Navy could maintain a forward presence of 111 ships (which is greater than today's presence of about 100) by relying on longer deployments for

aircraft carriers, large surface combatants, attack submarines, and amphibious warfare ships (under Approach 1). Alternatively, it could provide 112 ships by basing more ships overseas and using more crew rotation (Approach 2). But those approaches would have to be implemented more aggressively than would be required under a larger shipbuilding budget.

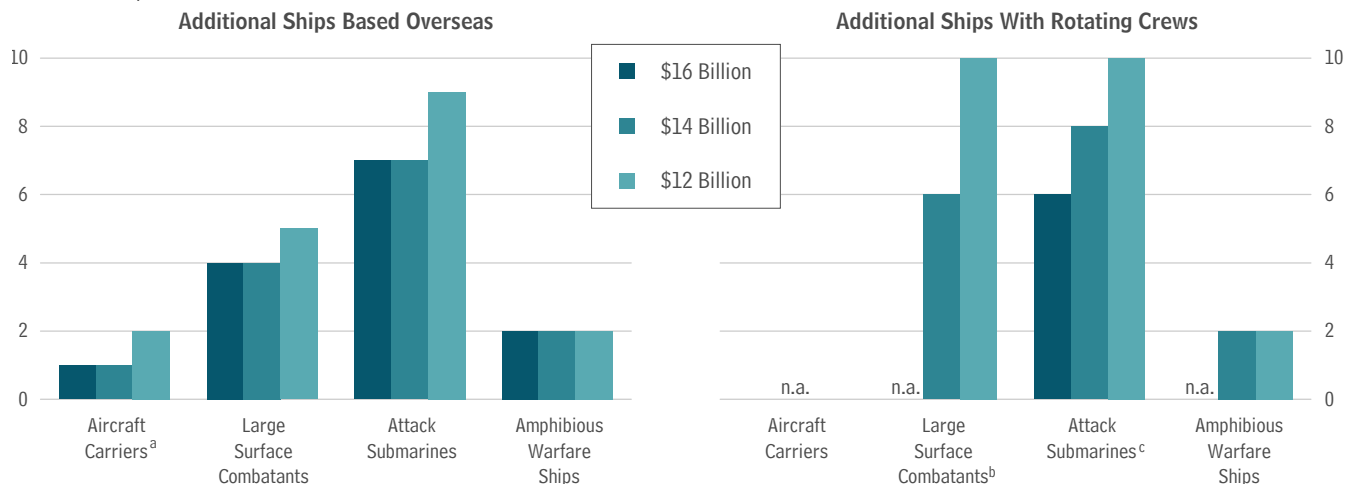
24. See Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2015 Shipbuilding Plan* (December 2014), [www.cbo.gov/publication/49818](http://www.cbo.gov/publication/49818).



**Figure 4.**

### Additional Ships Based Overseas and Additional Rotating Crews That Would Maintain the Same Amount of Forward Presence in 2044 as in 2013 With Smaller Fleets Than Under the Navy's Plan

Number of Ships



Source: Congressional Budget Office.

Notes: Ships based overseas are counted separately from those with rotating crews. At the end of 2013, the Navy based overseas 1 aircraft carrier, 9 surface combatants, 3 attack submarines, and 4 amphibious ships. It also based overseas 12 other ships of different types.

n.a. = not applicable.

- a. Under the \$12 billion budget, another aircraft carrier would be transferred from the continental United States to Hawaii.
- b. Uses multiple crewing.
- c. Uses a dual-crew system modeled in part on the existing system for ballistic missile submarines.

**Approach 1.** Under this approach, deployments would be longer or more frequent than if the annual shipbuilding budget was set for a \$16 billion average (see Figure 3):

- The Navy would adopt a variant of its Enhanced Carrier Presence Plan (that it proposed in 2013) instead of its plan to conduct 8-month-long carrier deployments under the Optimized Fleet Response Plan (or 10-month deployments discussed above for the \$16 billion shipbuilding budget).<sup>25</sup> Each U.S.-based aircraft carrier would be deployed for 12 months out of a 36-month operating cycle—twice for 6 months with an interval of 9 months between deployments (see Figure 2 on page 9).
- All U.S.-based large surface combatants would follow the same 36-month deployment schedule as the aircraft carriers.
- Twenty-two U.S.-based attack submarines—four more than under the \$16 billion budget—would routinely conduct 7-month deployments.

- All U.S.-based amphibious warfare ships would be deployed for 9 months out of a 27-month cycle.
- There would be no changes in the operation of littoral combat ships or any ships based overseas from the current plan. As is the case for the \$16 billion budget, the number of support ships would remain about the same as it is for today's fleet.

25. Before it adopted the Optimized Fleet Response Plan, the Navy considered another approach, the Enhanced Carrier Presence Plan, for its aircraft carriers. That plan called for an operating cycle of two 7-month deployments out of 36 months, with a 7-month interval between them—compared with the previous cycle of 6 to 7 months out of 32 and possibly an additional 2- or 3-month deployment. The Enhanced Carrier Presence Plan would have provided an additional carrier deployed overseas. Specifically, the Navy estimated that, for a cost increase of 20 percent for carrier operations (including the air wing), average global carrier presence would increase by 40 percent. The drawback was that crews would have spent more time at sea over the 36-month operating cycle than they would under the normal operating cycle. Spending caps imposed by the Budget Control Act of 2011 led the Navy to forgo the plan. See Jason Kelly, "Enhanced Carrier Presence—What Do I Need to Know...Why Should I Care?" *Navy Live* (blog entry, April 22, 2013), <http://go.usa.gov/fAEj>.



**Approach 2.** Under this approach, the Navy could maintain a forward presence of 112 ships under an annual shipbuilding budget of \$14 billion by increasing its use of overseas basing and crew rotation but still limiting all ship deployments to 6 months. Overseas basing for the four ship types (aircraft carrier, large surface combatant, attack submarine, and amphibious warfare ship) would match that discussed above for a \$16 billion annual budget (see Figure 4 on page 19). This approach would put a second carrier overseas, increase the number of large surface combatants based overseas from today's planned 15 ships to 19, increase the number of attack submarines based overseas from a planned 4 to 11, and increase the number of amphibious warfare ships overseas from 4 to 6.

Approach 2 would have more ships using rotating crews than would be the case under a \$16 billion budget. Six large surface combatants would use multiple crews: Two of those six would remain at a forward operating location and the crews of the remaining ships would rotate to those ships to increase the overall amount of presence provided by the group. That forward-based ship would return to the United States less frequently than it would under the regular operating cycle. Two smaller amphibious warfare ships would have rotating crews; there are none in today's Navy and none are included under Approach 2 for a \$16 billion budget. The attack submarine force would have eight ships with dual crews operating out of U.S. ports, two more than under the \$16 billion budget.

### Forward Presence Under an Annual Shipbuilding Budget of \$12 Billion

If the Navy received annual funding for shipbuilding that was equivalent to the amounts it spent in the 1990s, by 2044 its fleet of battle force ships would number 208. The Navy could maintain its forward presence at 108 to 110 ships by relying even more heavily on longer deployments or overseas basing and crew rotation than would be called for under a \$14 billion annual budget.

**Approach 1.** Under this approach, the Navy would deploy most aircraft carriers and large surface combatants for longer periods than it would with a \$14 billion budget (see Figure 3 on page 18):

- U.S.-based aircraft carriers would employ the Enhanced Carrier Presence Plan rather than the Optimized Fleet Response Plan. However, with one

fewer carrier than under a \$14 billion budget, the U.S.-based ships would conduct two 7-month deployments, with 7 months intervening, out of a 36-month operating cycle. The total period of deployment thus would be 2 months longer than under a \$14 billion budget.

- The operating cycle for all U.S.-based large surface combatants would parallel that for the aircraft carriers.
- Twenty-five of the Navy's U.S.-based attack submarines—three more than under a \$14 billion budget—would be deployed for 7 months out of a 24-month cycle.
- All U.S.-based amphibious warfare ships would be deployed for 9 months out of the 27-month cycle.
- There would be no changes from the current plan in the Navy's operation of its littoral combat ships.
- The number of support ships providing forward presence would remain about the same under a \$12 billion budget as it is for today's fleet.

**Approach 2.** With a \$12 billion average annual budget for shipbuilding, the Navy could maintain its forward presence by increasing the use of overseas basing and crew rotation and thereby limit all ship deployments to six months. The Navy would base two additional aircraft carriers overseas, while another carrier would be transferred from the continental United States to Hawaii (see Figure 4 on page 19). Thus, with a force of seven aircraft carriers, only three would remain based in the continental United States.

The number of other ships based overseas also would increase. The fleet of large surface combatants with home ports in other countries would increase from 15 under today's plans to 20 under a \$12 billion budget, the number of attack submarines would increase from 4 to 13, and the number of amphibious warfare ships would increase from 4 to 6.

Crew rotations would increase as well. The force of large surface combatants would consist of 10 ships and 2 amphibious warfare ships using multiple or dual crew rotation. The attack submarine force would have 10 ships using dual crews.

## Cost Implications

Although the Navy would spend less money on ship construction and operations with smaller fleets (as well as saving on aircraft procurement and operations because of the need to buy and maintain fewer carrier air wings), those reductions would be partly offset by the additional costs of maintaining a forward presence. By CBO's estimate, the savings attributable to the smaller fleet would be offset by less than 5 percent to about 10 percent under a \$16 billion annual budget for ship construction and by 23 percent to 45 percent under a \$12 billion budget, depending on the approach taken. After factoring in those offsets, CBO estimates that the smaller fleets would result in net savings averaging \$10 billion to \$17 billion or more a year (see Table 7).

CBO's estimates of the savings in operation and support costs are based on the agency's assumption of roughly proportional cuts in the various ship forces within the fleet, initially without considering any adjustments needed to maintain the current forward presence.<sup>26</sup> Thus, the cost in 2044 to operate the 208-ship fleet under a \$12 billion annual budget would be \$30 billion—about two-thirds of the \$43 billion cost in the same year to operate the 303-ship fleet anticipated in the Navy's 2015 shipbuilding plan. CBO relied on current operating costs to estimate costs for 2044, even though the design specifics of the ships of the future, and thus their costs, cannot be reliably estimated today. If the estimated reduction in operations spending is added to the assumed cuts in ship

construction, total annual savings in 2044—out of a total annual cost of \$64 billion estimated for that year under the Navy's 2015 plan—would be \$11 billion under a \$16 billion shipbuilding budget and \$22 billion under a \$12 billion budget (all measured in 2014 dollars).

Those savings would be partially offset by the cost of steps taken to maintain the Navy's forward presence. Although they are difficult to estimate precisely, CBO formulated some rough estimates of additional, recurring annual costs (including military pay and benefits, operations, and maintenance) and onetime costs (such as infrastructure construction) for each approach. To project recurring costs, CBO used information from the Future Years Defense Program, among other sources, and to estimate onetime costs it relied on several sources, but most heavily on a forthcoming RAND report.<sup>27</sup> In general, projected costs for Approach 2 are greater than those for Approach 1.

**Net Savings Under Approach 1.** Recurring costs from longer and more frequent deployments would include increased spending on ship maintenance, fuel, and sea pay. CBO increased its estimates of maintenance costs according to the proportion of maintenance days to at-sea days under the various ships' operating cycles. For example, if there is a 1-to-3 ratio of maintenance to at-sea days for an amphibious warfare ship, a deployment of two additional months, resulting in 30 additional days at sea, would increase the ship's time in maintenance by 10 days.<sup>28</sup>

On that basis, CBO estimates that the additional costs for maintenance and fuel from longer deployments could amount to a few hundred million dollars per year under a \$16 billion budget but would probably run to a few billion dollars per year under a \$12 billion budget. Moreover, in the latter case, additional sea pay would add as much as several hundred million dollars per year to the Navy's operating budget. Overall, those recurring costs under Approach 1 would reduce annual procurement and

26. Operation and support costs include the amounts paid from the Navy's military personnel appropriation for military pay and bonuses and those paid from the Navy's operation and maintenance appropriation for civilian salaries, military health care, daily operation of the Navy's units, maintenance of equipment, training, support contractors, and so on. CBO added the costs of operating carrier air wings to the costs of the aircraft carriers themselves but did not include any savings that might come from purchasing fewer aircraft for those wings. CBO's estimates are based on data for the 2015–2019 period as outlined in the Department of Defense's (DoD's) 2015 Future Years Defense Program. (In that five-year plan, DoD does not account for potential supplemental or emergency appropriations to fund ongoing operations.) CBO's estimates include a share of the Defense Health Program's costs that support sailors assigned to ships and air wings (and their families) but that would be paid for out of non-Navy accounts in DoD's budget. CBO also included the costs of recruiting and training sailors, which it estimated as a fraction of the recruitment and training budgets for sailors assigned to the ships and air wings considered for this report.

27. Michael McMahon and Roland Yardley, *Alternatives to Increase Carrier Strike Group (CSG) Forward Posture* (RAND Corporation, forthcoming).

28. The Navy's budget calls for 45 days at sea for every 90 days when a ship is deployed—or one-half the time. When the ship is not deployed, the budget calls for 20 days at sea out of every 90.

**Table 7.****Costs for and Savings From Maintaining Forward Presence Under Alternative Shipbuilding Budgets**

Billions of 2014 Dollars

	Navy's 2015 Plan (\$21 Billion)	Average Annual Shipbuilding Budget		
		\$16 Billion	\$14 Billion	\$12 Billion
Number of Battle Force Ships in 2044	303	251	230	208
Annual Operation and Support Costs for Battle Force Ships <sup>a</sup>	\$43 billion	\$37 billion <sup>b</sup>	\$33 billion <sup>b</sup>	\$30 billion <sup>b</sup>
<b>Additional Annual Operation and Support Costs by 2044</b>				
Approach 1: Longer Deployments				
Ship maintenance and fuel	n.a.	A few hundred million dollars	Several hundred million dollars	A few billion dollars
Sea pay <sup>c</sup>	n.a.	About \$100 million	A few hundred million dollars	Several hundred million dollars
Approach 2: More Overseas Basing and Crew Rotation				
Ship maintenance and fuel	n.a.	A few hundred million dollars	Several hundred million dollars	A few billion dollars
Additional crews, training, and base operations	n.a.	Several hundred million dollars	A few billion dollars	Several billion dollars
<b>Net Average Annual Recurring Savings by 2044</b>				
Approach 1: Longer Deployments	n.a.	\$11 billion	\$16 billion	\$17 billion or more
Approach 2: More Overseas Basing and Crew Rotation	n.a.	\$10 billion	\$12 billion or more	\$12 billion or more
<b>Additional Onetime Costs From 2015 Through 2044</b>				
Approach 1: Longer Deployments	n.a.	0	0	0
Approach 2: More Overseas Basing and Crew Rotation				
Overseas bases	n.a.	\$3 billion to \$10 billion	\$3 billion to \$10 billion	\$16 billion to \$25 billion
U.S.-based infrastructure	n.a.	A few hundred million dollars	A few hundred million dollars	Several hundred million dollars

Source: Congressional Budget Office.

Source: Congressional Budget Office.

Notes: Ships' operating costs are based on current amounts.

n.a. = not applicable.

- a. Operation and support costs include the amounts paid from the Navy's military personnel appropriation for military pay and bonuses and those paid from the Navy's operation and maintenance appropriation for civilian salaries, military health care, daily operation of the Navy's units, maintenance of equipment, training, support contractors, and so on. CBO added the costs of operating carrier air wings to the costs of the aircraft carriers themselves. CBO's estimates are based on data for the 2015–2019 period as outlined in the Department of Defense's (DoD's) 2015 Future Years Defense Program. (In that five-year plan, DoD does not account for potential supplemental or emergency appropriations to fund ongoing operations.) CBO's estimates include a share of the Defense Health Program's costs that support sailors assigned to ships and air wings (and their families), although that would be paid for out of non-Navy accounts in DoD's budget. CBO also included the costs of recruiting and training sailors, which it estimated as a fraction of the recruitment and training budgets for sailors assigned to the ships and air wings considered for this report.
- b. Figures are for operation and support costs before adjustment using either Approach 1 or Approach 2.
- c. Sea pay does not include additional retention bonuses, which could be required to meet retention goals with longer deployments.

operating savings from buying and operating smaller fleets by less than 5 percent under a \$16 billion budget, but by as much as 20 percent under a \$12 billion budget. Nevertheless, net annual savings would still range from roughly \$11 billion to \$17 billion for the three different-sized fleets considered in this analysis.

Other potential recurring costs that CBO did not include in its analysis are the differences in sea pay and retention bonuses that might be needed if longer deployments caused the Navy to regularly miss its retention goals. If such increases turned out to be necessary, Approach 1 would cost somewhat more, although not enough to offset the lower costs of building and operating a smaller fleet. That approach would not involve any additional onetime costs.

**Net Savings Under Approach 2.** The recurring costs for ship maintenance and fuel that arise from basing more ships overseas and using rotating crews would be roughly the same as those calculated for Approach 1. But the cost of paying, training, and housing the additional personnel that would be needed to maintain rotating crews plus the cost of operating new overseas carrier bases would amount to several hundred million dollars annually under a \$16 billion shipbuilding budget—and several billion dollars a year under a \$12 billion budget, mostly because of the large number of additional crews needed to maintain forward presence with such a small fleet.

All together, recurring costs under Approach 2 would offset 10 percent of the savings arising from buying and operating the smaller fleets under a \$16 billion budget and as much as 45 percent of the savings under a \$12 billion budget. Net annual savings would amount roughly to \$10 billion to \$12 billion for the three different-sized fleets considered in this analysis. Moreover, some recurring costs could be shared by the host country—Japan and South Korea, for example, help defray expenses for U.S. forces stationed in those countries—but CBO did not account for that possibility in its analysis.

Unlike Approach 1, Approach 2 would result in significant onetime costs: Billions of dollars would be required to build new overseas bases, particularly for aircraft carriers. Although CBO has not formulated independent estimates, a report that was released in August 2012 by the Center for Strategic and International Studies proposed basing an aircraft carrier in Australia and estimated the costs of doing so. The report stated that the cost of

establishing an aircraft carrier base in Guam several years ago had been estimated at about \$6.5 billion.<sup>29</sup> Unofficial Navy estimates put the onetime price of basing a carrier in Australia at about \$10 billion. RAND's forthcoming report estimates fixed costs of about \$1 billion to base a second carrier in Japan and \$4 billion to \$10 billion to base one in Guam.<sup>30</sup> Although the RAND report did not examine the Australia option in detail, the costs would probably be comparable to those for Guam. For two additional carriers based overseas the costs would be higher. In addition, some small additional infrastructure costs (mostly for training facilities) would be required in the United States to support the new systems for rotating crews to large surface combatants, attack submarines, and amphibious warfare ships. CBO estimates onetime costs of \$3 billion to \$10 billion to provide forward presence under the \$14 billion and \$16 billion shipbuilding budgets and of \$16 billion to \$25 billion under the \$12 billion budget. Those onetime costs would not exceed about two years of annual savings.

**Costs Not Considered in CBO's Analysis.** Additional costs that were not considered in this analysis would accrue after 2044 under either approach. Because more intensive use of nuclear-powered aircraft carriers and attack submarines would shorten the service lives of those weapon systems, replacement would occur sooner than is dictated by current schedules. The service life of a dual-crewed attack submarine, at about 27 years, would be 18 percent shorter than the 33 years currently anticipated for a single-crewed submarine.<sup>31</sup> An aircraft carrier operating under the Enhanced Carrier Presence Plan could have a service life of about 45 years, 10 percent shorter than the Navy's current plan of 50 years. In contrast, more intensive use of surface ships (which are not nuclear powered)

29. David J. Berteau and others, *U.S. Force Posture Strategy in the Asia Pacific Region: An Independent Assessment* (Center for Strategic and International Studies, August 2012), p. 74, <http://tinyurl.com/bbhaphg>.

30. Michael McMahon and Roland Yardley, *Alternatives to Increase Carrier Strike Group (CSG) Forward Posture* (RAND Corporation, forthcoming). Most of the uncertainty in RAND's cost analysis for Guam lies in the investment needed to improve the land-based airfield on the island that would support the carrier's air wing when the ship is in port. Further study of that issue would be necessary if the Guam option was chosen.

31. See Congressional Budget Office, *Increasing the Mission Capability of the Attack Submarine Force* (March 2002), [www.cbo.gov/publication/13538](http://www.cbo.gov/publication/13538).

would not necessarily result in a shorter service life as long as the Navy's maintenance protocols compensated for the increased operational use.<sup>32</sup> Even if the added costs of reduced service life were considered to be accrued during the period addressed in this analysis, they would

not offset a substantial portion of the annual savings projected for the two approaches discussed here.

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32. Wm. Brent Boning, *Ship Depot Maintenance and Expected Service Life* (CNA Corporation, February 2013).



## **Appendix: Comparison of Different-Sized Fleets Under Two Approaches to Maintaining Forward Presence**

**T**he Navy's 30-year shipbuilding plan envisions building a fleet of 306 ships (it would have 303 ships in 2044). The funding required to implement that plan, however, is considerably more than the amounts the Navy has received over the past 30 years. The Congressional Budget Office projected the size of the Navy's fleet with annual funding of \$16 billion, \$14 billion, and \$12 billion, and it examined two approaches for

maintaining the Navy's forward presence with smaller fleets. The first approach would emphasize longer deployments than under current practice; the second would emphasize more overseas basing and more crew rotation than is the case under current practice. Table A-1 is a summary of key data for comparing the three resulting fleets under the two approaches.

**Table A-1.**

### Number and Status of Ship Types, Deployment Lengths, and Basing and Crew Rotation Under Two Approaches and Several Alternative Shipbuilding Budgets, 2044

Ship Count

	2013 Inventory <sup>a</sup>	Navy's 2015 Plan (\$21 Billion)	Approach 1: Longer Deployments			Approach 2: More Overseas Basing and Crew Rotation		
			\$16 Billion	\$14 Billion	\$12 Billion	\$16 Billion	\$14 Billion	\$12 Billion
Total Battle Force Ships	289	303	251	230	208	251	230	208
Ships Providing a Forward Presence at Any Given Time	103	130	113	111	108	113	112	110
<b>Aircraft Carriers</b>								
Ships Conducting 6-Month Deployments	0	0	0	0	0	7	6	4
Ships Conducting 7- to 8-Month Deployments	7	9	0	0	0	0	0	0
Ships Conducting 8-Month or Longer Deployments	2	0	8	7 <sup>b</sup>	6 <sup>b</sup>	0	0	0
Ships Based Overseas	1	1	1	1	1	2	2	3
Ships With a Rotating Crew	0	0	0	0	0	0	0	0
<b>Ship Inventory</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>8</b>	<b>7</b>	<b>9</b>	<b>8</b>	<b>7</b>
<b>Large Surface Combatants</b>								
Ships Conducting 6-Month Deployments	0	0	0	0	0	53	39	25
Ships Conducting 7- to 8-Month Deployments	63	83	0	0	0	0	0	0
Ships Conducting 8-Month or Longer Deployments	12	0	57	49 <sup>b</sup>	40 <sup>b</sup>	0	0	0
Ships Based Overseas	9	15	15	15	15	19	19	20
Ships With a Rotating Crew	0	0	0	0	0	0	6 <sup>c</sup>	10 <sup>c</sup>
<b>Ship Inventory</b>	<b>84</b>	<b>83</b>	<b>72</b>	<b>64</b>	<b>55</b>	<b>72</b>	<b>64</b>	<b>55</b>
<b>Small Surface Combatants and Mine Countermeasures Ships</b>								
Ships Conducting 6-Month Deployments	15	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ships Conducting 7- to 8-Month Deployments	3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ships Conducting 8-Month or Longer Deployments	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ships Based Overseas	8	16	16	16	16	16	16	16
Ships With a Rotating Crew	9	52	37	32	27	37	32	27
<b>Ship Inventory</b>	<b>35</b>	<b>52<sup>d</sup></b>	<b>37<sup>d</sup></b>	<b>32<sup>d</sup></b>	<b>27<sup>d</sup></b>	<b>37<sup>d</sup></b>	<b>32<sup>d</sup></b>	<b>27<sup>d</sup></b>

Continued

Table A-1.

Continued

### Number and Status of Ship Types, Deployment Lengths, and Basing and Crew Rotation Under Two Approaches and Several Alternative Shipbuilding Budgets, 2044

Ship Count

			Approach 1: Longer Deployments			Approach 2: More Overseas Basing and Crew Rotation		
	2013 Inventory <sup>a</sup>	Navy's 2015 Plan (\$21 Billion)	\$16 Billion	\$14 Billion	\$12 Billion	\$16 Billion	\$14 Billion	\$12 Billion
Attack Submarines								
Ships Conducting 6-Month Deployments	43	48	17	11	6	22	18	12
Ships Conducting 7- to 8-Month Deployments	8	0	18	22	25	0	0	0
Ships Conducting 8-Month or Longer Deployments	1	0	0	0	0	0	0	0
Ships Based Overseas	3	4	4	4	4	11	11	13
Ships With a Rotating Crew	0	0	0	0	0	6 <sup>e</sup>	8 <sup>e</sup>	10 <sup>e</sup>
Ship Inventory	55	52	39	37	35	39	37	35
Amphibious Warfare Ships								
Ships Conducting 6-Month Deployments	0	0	0	0	0	21	18	17
Ships Conducting 7- to 8-Month Deployments	19	27	0	0	0	0	0	0
Ships Conducting 8-Month or Longer Deployments	8	0	23 <sup>f</sup>	22 <sup>f</sup>	21 <sup>f</sup>	0	0	0
Ships Based Overseas	4	4	4	4	4	6	6	6
Ships With a Rotating Crew	0	0	0	0	0	0	2	2
Ship Inventory	31	31	27	26	25	27	26	25
Ballistic and Guided Missile Submarines <sup>g</sup>								
Ship Inventory	18	12	10	8	6	10	8	6
Combat Logistics and Support Ships <sup>h</sup>								
Ship Inventory	56	63	59	55	53	59	55	53

Source: Congressional Budget Office.

Notes: Deployments for ships with rotating crews are longer than 9 months, although the crews are deployed for much shorter periods.

n.a. = not applicable.

- Ship counts refer to the entire operating cycle.
- All aircraft carrier and large surface combatant deployments would follow the Navy's enhanced carrier presence plan. Deployments might last 6 or 7 months, but two deployments would occur within a 21-month period and the 36-month operating cycle.
- Uses multiple crew rotation; ships are based in the United States.
- The small surface combatant and mine countermeasures inventory in the future will consist of littoral combat ships and therefore all will have rotating crews but not all will be based overseas.
- Uses a dual-crew system modeled in part on the existing system for ballistic missile submarines; submarines are based in the United States.
- All deployments are nearly 9 months long.
- All ballistic missile and guided missile submarines operate dual crews but are not counted in totals for a forward presence.
- Most combat logistics and support ships operate with civilian mariners and are available for forward presence 270 days of the year.



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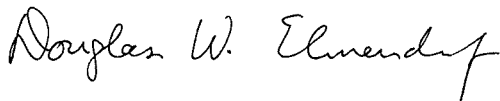
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## About This Document

This Congressional Budget Office report was prepared at the request of the former Chairman and the former Ranking Member of the Seapower and Projection Forces Subcommittee of the House Armed Services Committee. In accordance with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Eric Labs of CBO's National Security Division prepared the report with guidance from David Mosher and Matthew Goldberg. Raymond Hall of CBO's Budget Analysis Division produced the cost estimates with guidance from Sarah Jennings. David Arthur of CBO provided helpful comments on the report, as did Bryan Clark of the Center for Strategic and Budgetary Assessments and Scott Truver of Gryphon Technologies LC. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Jeffrey Kling, John Skeen, and Robert Sunshine reviewed this report; Kate Kelly edited it; and Maureen Costantino prepared it for publication. An electronic version is available on CBO's website ([www.cbo.gov/publication/49989](http://www.cbo.gov/publication/49989)).



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March 2015